Energy distributions of plume ions from silver at different angles ablated in vacuum.

Christensen, Bo Toftmann; Schou, Jørgen; Canulescu, Stela

Publication date:
2012

Energy distributions of plume ions from silver at different angles ablated in vacuum.

B. Toftmann, J. Schou and S. Canulescu
DTU Fotonik, Risø Campus, Technical University of Denmark, DK-4000 Roskilde, Denmark (josc@fotonik.dtu.dk)

A typical pulsed laser deposition (PLD) is carried out for a fluence between 0.5 and 2.5 J/cm^2. The ablated particles are largely neutrals at the lowest fluence, but the fraction of ions increases strongly with fluence and accounts for more 0.5 of the particles at 2.5 J/cm^2 [1,2]. Since it may be comparatively difficult to measure the energy and angular distribution of neutrals, measurements of the ionic fraction will be valuable for any modeling of PLD.

We have irradiated silver in a vacuum chamber (~ 10^{-7} mbar) with a Nd:YAG laser at a wavelength of 355 nm and made detailed measurements of the time-resolved angular distribution. The ion flow in different directions has been measured with a hemispherical array of Langmuir probes, by which the time-of-flight spectra the in all directions can be recorded [1,2]. In contrast to earlier work the beam spot was circular such that any flip-over effect of the plume was avoided [3]. The angular distribution of ions is strongly peaked in forward direction, and also the energy distribution peaks at much higher energy in forward direction than at oblique angles.

(1) B. Toftmann and J. Schou, submitted to Appl. Phys. A (2011)
(2) B. Thestrup et al. Appl. Surf. Sci. 197-198, 175 (2002).
(3) T. N. Hansen, J. Schou and J. G. Lunney, Appl. Phys. Lett. 72, 1829 (1998).